It is in the centre of the southern half of the State, 18 miles northeast of Hailey.

The highest mountains in Utah are in the Uinta Range in the northeastern portion of the State. The peak supposed to be highest was named after the prominent geologist, G. K. Gilbert. Its altitude was given as 13,687 feet. A recent survey has shown that Gilbert Peak is only 13,422 feet and Mt. Emmons, 13,428 feet, is slightly higher. San Francisco Mountain is the highest point in Arizona. It is the summit of a great mass of volcanic rock, near the Grand Cañon, and attains a height of 12,794 feet. Rising prominently above the great deserts of Nevada, Wheeler Peak, in the eastern part of that State, attains an altitude of 13,058 feet, according to the U. S. Coast and Geodetic Survey. It is much higher than any other summit. It is sometimes known locally as Jeff Davis Peak, which is not the correct name.

California, as has already been stated, contains Mt. Whitney, the highest point in the United States, as well as Death Valley and Salton Sink, the lowest points. Mt. Rainier, also known as Mt. Tacoma, with an altitude of 14,363 feet, is the highest peak in the Northwest. Many erroneous figures are ascribed to it, 14,526 being the one most generally given. Mt. Hood is by far the highest summit in Oregon. Its height is 11,225 feet, according to precise measurements made by the U. S. Geological Survey last Summer.

AN ALLUVIAL FAN, NEAR FIELD, IN BRITISH COLUMBIA.

BY

FRED. H. LAHEE.

About four miles northwest of the town of Field, in British Columbia, and separated from it by Mount Burgess, lies the beautiful sheet of water known as Emerald Lake. Situated near the head of a broad glacial valley, this lake has been formed probably by the damming of the original channel by a heap of glacial débris, perhaps supported by a resistant, outstanding ledge of bedrock at this place. Across this barrier, the water flows out southwards.

The present interest, however, lies not so much in the lake and its mode of formation as in the fact that it is slowly being filled in at its northern end by a large alluvial fan, or, better, as will presently be explained, by a *double* alluvial fan.

Since the streams that feed the lake have their source in snow and ice-fields, high up on the adjacent mountains, they are burdened with a considerable amount of rock waste, not only that which has been eroded by glacial scouring above, but also that which, by virtue of their rapid descent, these torrents have been enabled to remove from the walls of their channels. This load they can easily wash into the valley; but as soon as the water reaches the much gentler grade of the valley floor, a great deal of the material, which is too heavy to be borne farther, is dropped, the coarser, near the foot of the cascades, the lighter, at some distance.

After the stream has deposited so much material that its bed is

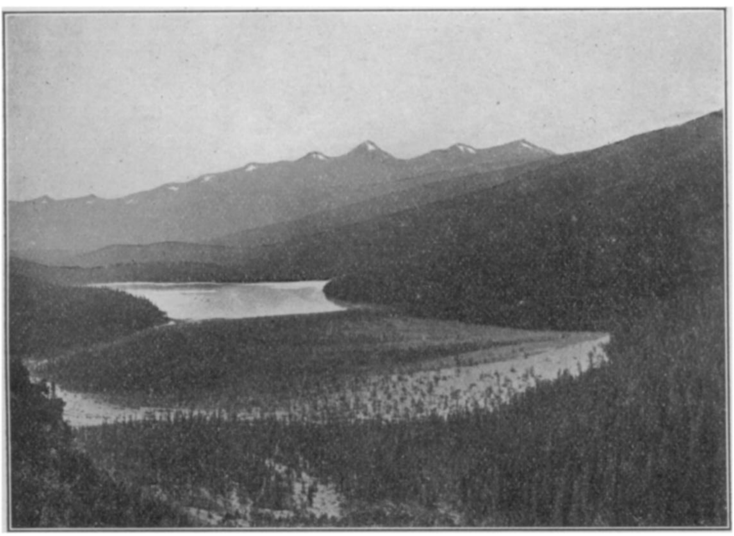

FIG. 1.—EMERALD LAKE AND FAN.
(View looking southward from N. E. corner of map.)

higher than the ground on each side, something may divert it from the older course, and it will then begin to build up its bed again, until another change occurs. In this way, shifting from side to side in a rather haphazard, spasmodic manner, it lays down a fan-shaped body of loose, more or less water-worn, sediments in the shape of a broad low cone, the apex of which is at the point where the feeding stream enters upon the valley floor from the steep mountain gorge.

These features are well exhibited by the Emerald Lake fan. In reality this is a double or compound fan in that it is the result of the action of two streams, the east and west branches, which unite near the northern border of the valley. Since the fan of the west branch

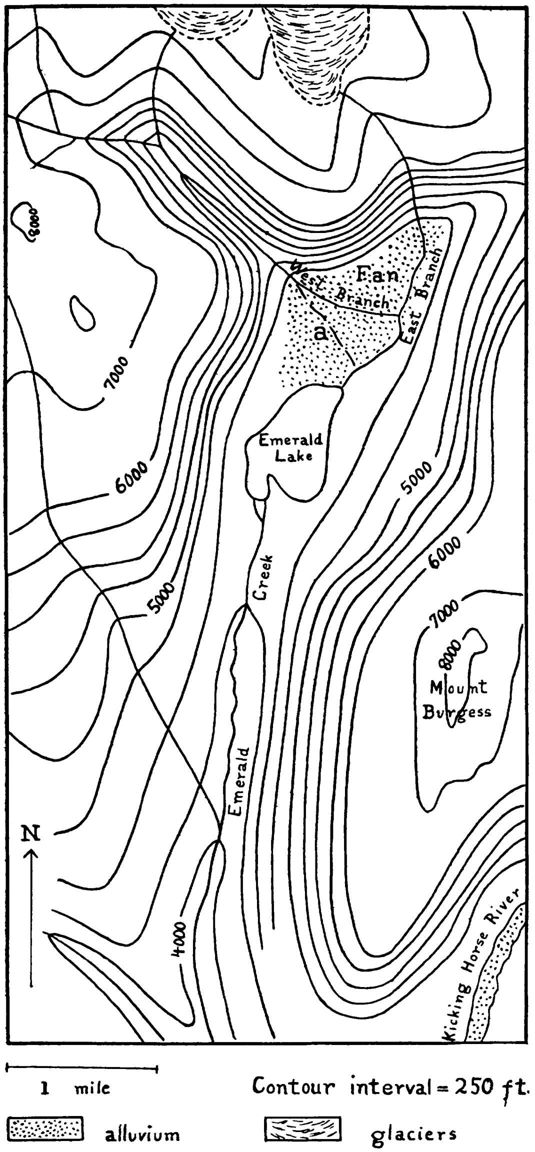

FIG. 2.—CONTOUR MAP OF THE GLACIAL VALLEY IN WHICH EMERALD LAKE AND THE ALLUVIAL FAN ARE SITUATED.
("a" on the fan indicates the course of the west branch as mapped in 1902.)

is much larger than that of the east branch, succeeding descriptions will refer to the former unless otherwise specified. It is this fan (of the west branch) which best illustrates the facts above mentioned. Near its origin, it consists of coarse, semi-rounded fragments of the rocks that constitute the neighbouring mountains. Near the middle of its slope, the pebbles are more rounded and average smaller. At the periphery, especially that part which fringes the lake, the sediments are composed chiefly of sand and clay.

Perhaps the most interesting fact discovered in the examination of this region in the summer of 1907 was the absence of a stream in the position mapped five or six years ago by the Canadian Geological Survey.* (See broken line crossing the fan, Fig. 2.) At that time the west branch flowed

* Lake Louise Sheet of the Topographical Map of the Canadian Rocky Mountains. Published in 1902 by the Department of the Interior, Canada.

southeast across its fan, and united with the east branch very near the lake. In 1907, the west branch flowed about eastwards (full line, Fig. 2). This marked shift in the course of the stream was evidenced in the field by a network of dry channels radiating from the apex of the alluvial cone. They were shallow and frequently contained small sandbars.

Such clear proof of recent change confirms the view that the west branch, in particular, is very active in its work. That it is more efficient than the east branch is demonstrated not only by the greater size of its fan, but also by the fact that this fan has shoved the east stream against the eastern valley wall.

There is no doubt that the fan is growing. At what rate this development is going on, is not certain; but it must be relatively rapid, for, although trees of twenty or thirty years are found on many parts of the deposit, particularly in the older portions, these are generally rather thinly scattered (See Fig. 1). Vegetation is scarce because spring freshets tend to destroy it and because there is little or no rock decay.

Emerald Lake was described above as occupying a depression near the head of a glacial valley. An examination of the map (Fig. 2) shows that the fan is in the northern half of this depression; that is, the lake and the fan together are situated in a single basin at the upper end of the valley. This is even more distinct in the field, where the continuity of the bounding walls of both fan and lake is most conspicuous.

What, then, should be the structure of such an alluvial fan? On account of the constant forward growth of the cone, more recent coarse pebbles will eventually come to rest upon less recently deposited sand. In other words, a radial cross-section should represent an upward gradation from fine to coarse (Fig. 3). (This is the structure of a typical filling lake basin.) But there will be variations in this order, due to the very evident seasonal fluctuations

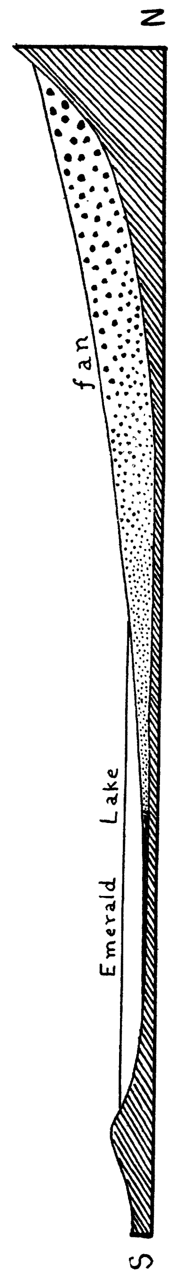

FIG. 3.—DIAGRAMMATIC CROSS-SECTION OF EMERALD LAKE AND THE ALLUVIAL FAN.
(Size of dots indicates coarseness of sediments. Cross-lines indicate floor of valley, whether bed-rock or glacial material.)

in the quantity of water delivered. Spring floods will carry heavy pebbles farther than the weaker currents of autumn can. Hence, at any given spot, a cross-section of the fan will also show annual vertical variations in the texture of the sediments.

From the foregoing account, the inference is obvious that the fan is growing and that, in so doing, it is filling the lake. This is indicated by the five facts already explained: (1) the surface of the fan is dissected by channels of *recent* formation; (2) the weaker stream has been pushed against the valley wall; (3) the deposits are fresh, and the vegetation is consequently sparse; (4) the lake and the fan are in the same depression; and, (5) the structural relation between the lake and the fan is that of a filling lake basin. To-day Emerald Lake appears to be about half its original size.

ON THE NATURE OF MAPS AND MAP LOGIC.*

BY

DR. MAX ECKERT.

Translated by W. JOERG.

"Maps are the basis of geography."

"Maps represent the deposit of geographic knowledge for any given period."

"Maps are the indispensable tools and implements of geography and geographic teaching."

These and similar sayings of eminent geographers and thinkers have greatly stimulated geographic thought and have raised maps to a higher position than that usually occupied by illustrative material in other sciences. They are no longer merely considered as aids that require the addition of descriptive text to portray adequately geographic phenomena, but as products of scientific research which, being complete in themselves, convey their message by means of their own signs and symbols and through these furnish the basis for further geographic deduction. Emil von Sydow expressed this thought fifty years ago; its truth, however, is often not yet sufficiently realized.

This special function of maps in geography calls for a detailed investigation of their properties, as revealed by a study of their con-

* Abstract of a paper read before the German Geographical Meeting at Nuremberg, May, 1907.